

## Implicit Differentiation Classwork

1.

Consider the curve defined by  $x^2 + xy + y^2 = 27$ .

- (a) Write an expression for the slope of the curve at any point  $(x, y)$ .
- (b) Determine whether the lines tangent to the curve at the  $x$ -intercepts of the curve are parallel. Show the analysis that leads to your conclusion.
- (c) Find the points on the curve where the lines tangent to the curve are vertical.

2.

Consider the curve given by  $xy^2 - x^3y = 6$ .

- (a) Show that  $\frac{dy}{dx} = \frac{3x^2y - y^2}{2xy - x^3}$ .
- (b) Find all points on the curve whose  $x$ -coordinate is 1, and write an equation for the tangent line at each of these points.
- (c) Find the  $x$ -coordinate of each point on the curve where the tangent line is vertical.

3.

Consider the curve given by  $y^2 = 2 + xy$ .

- (a) Show that  $\frac{dy}{dx} = \frac{y}{2y - x}$ .
- (b) Find all points  $(x, y)$  on the curve where the line tangent to the curve has slope  $\frac{1}{2}$ .
- (c) Show that there are no points  $(x, y)$  on the curve where the line tangent to the curve is horizontal.
- (d) Let  $x$  and  $y$  be functions of time  $t$  that are related by the equation  $y^2 = 2 + xy$ . At time  $t = 5$ , the value of  $y$  is 3 and  $\frac{dy}{dt} = 6$ . Find the value of  $\frac{dx}{dt}$  at time  $t = 5$ .